

CLAIMS

- [001] A circuit arrangement for protecting a heating element (1) from overheating, whose resistance value is a function of its temperature, wherein the circuit has the following features: a power supply coupled to the heating element (1) for supplying a current to the heating element (1) by means of a switch means (2); a switch control circuit (3) with an output (34) for controlling the switching means (2), wherein the switching means (2) is switched to a conducting state when the switch control circuit (10) is in a first state, and is switched to a non-conducting state when the switch control circuit (3) is in a second state; a current sensor means (4) coupled to the heating element (1), the output (41) of which provides a signal proportional to the current flowing through the heating element (1); a first scaling means (5), the output of which provides a signal proportional to the supply voltage of the heating element (1); a first detector means (6) having inputs (62, 63) each coupled to the outputs (41, 51) of the current sensor means (4) and the first scaling means (5), the output (66) of which provides a difference signal formed from the signals of the current sensor means (4) and the scaling means (5); an evaluation circuit (7; 8; 9; 10) by which means the difference signal determined by the first detector means (6) may be compared with a reference signal and depending on the result, the switch control circuit (3) can be brought from the first into the second state by the evaluation circuit (3).
- [002] The circuit arrangement according to claim 1, characterised in that the current sensor means (4) and the first scaling means (5) are configured such that the signals which can be tapped at their output (41, 51) have the same magnitude at the nominal resistance of the heating element.
- [003] The circuit arrangement according to claim 1 or claim 2, characterised in that a difference voltage can be detected by the first detector means (6) only in the event of a change in the resistance of the heating means (1).
- [004] The circuit arrangement according to any one of the preceding claims, characterised in that the evaluation circuit comprises a second detector means (10) with two inputs

(101, 102) and one output (106), wherein the output signal of the first detector means (6) can be supplied to one input (101) and the reference signal can be supplied to the other input (102), and wherein the output (106) forms the output of the evaluation circuit.

- [005] The circuit arrangement according to any one of the preceding claims, characterised in that the evaluation circuit has a second scaling means (9) which is used to set the reference signal.
- [006] The circuit arrangement according to claim 5, characterised in that the second scaling means (9) is coupled to the supply voltage acting upon the heating element (1) to derive the reference signal from the supply voltage.
- [007] The circuit arrangement according to any one of claims 4 to 6, characterised in that the output (106) of the second detector means (10) is fed back to the input (102).
- [008] The circuit arrangement according to any one of the preceding claims, characterised in that the power supply of the heating element is an AC voltage, and a rectifier arrangement (7) and a smoothing circuit (8) are connected between the first and the second detector means (6; 10).
- [009] The circuit arrangement according to any one of the preceding claims, characterised in that the switching means (2) is a relay which becomes operative in the first state of the switch control circuit (3) when the heating element (1) is operating correctly.
- [010] The circuit arrangement according to any one of the preceding claims, characterised in that the heating element (1) is an electrical resistance heater, especially made from thick film paste, with PTC behaviour where the resistance increases with increasing temperature.

- [011] A heating device for fluids, characterised in that a circuit arrangement for protecting a heating element (1) from overheating according to any one of the preceding claims is provided.
- [012] A method for the fused protection from damage of a heating device for fluids comprising a heating element, wherein the resistance value of the heating element is a function of its temperature and the change in the resistance is detected and compared with a reference signal in order that the heating circuit can optionally be interrupted by means of a switching means.